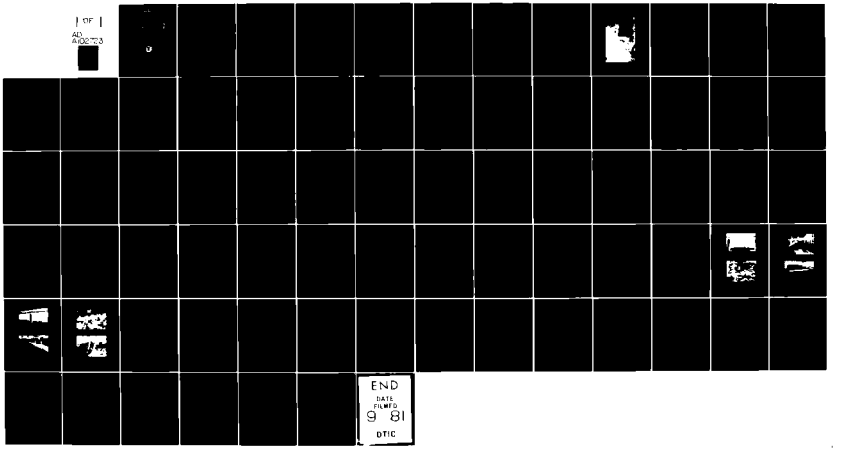
AD-A102 723 NEW JERSEY DEPT OF ENVIRONMENTAL PROTECTION TRENTON --ETC F/G 13/13
NATIONAL DAM SAFETY PROGRAM. CEDAR LAKE DAM (NJ00805), PASSAIC --ETC(U)
MAY 81 R J MCDERMOTT, J E GRIBBIN DACW61-79-C-0011
UNCLASSIFIED DAEN/NAP-53842/NJ00805-81/ NL



LEVEL II

PASSAIC RIVER BASIN
TRIBUTARY TO ROCKAWAY RIVER,
MORRIS COUNTY
NEW JERSEY

CEDAR LAKE DAM

NJ 00805

PHASE 1 INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

DACW61-79-C-0011

DEPARTMENT OF THE ARMY
Philadelphia District
Corps of Engineers
Philadelphia, Pennsylvania

MAY 1981

REPT. NO. DAEN/NAP-53842/NJ00805-81/05

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE

READ INSTRUCTIONS BEFORE COMPLETING FORM

1. REPORT NUMBER: DAEN/NAP-53842/NJ00805-81/05	2. GOVT ACCESSION NO.: AD-A102 723
3. RECIPIENT'S CATALOG NUMBER:	
4. TITLE (and Subtitle): Phase I Inspection Report National Dam Safety Program Cedar Lake Dam, NJ00805 Morris County, NJ	5. TYPE OF REPORT & PERIOD COVERED: FINAL
	6. PERFORMING ORG. REPORT NUMBER:
7. AUTHOR(s): McDermott, Richard J. P.E. Gribbin, John E. P.E.	8. CONTRACT OR GRANT NUMBER(s): DACW61-79-C-0011
9. PERFORMING ORGANIZATION NAME AND ADDRESS: Storch Engineers 220 Ridgedale Florham Park, NJ 07932	
11. CONTROLLING OFFICE NAME AND ADDRESS: NJ Department of Environmental Protection Division of Water Resources P.O. Box CN029 Trenton, NJ 08625	12. REPORT DATE: May 1981
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16. DISTRIBUTION STATEMENT (of this Report)

Approved for public release; distribution unlimited.

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

Copies are obtainable from National Technical Information Service, Springfield, Virginia 22151.

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Dams
Embankments
Visual Inspection
Structural Analysis
National Dam Safety Program
Spillways
Embankments
Rockaway River, N.J.
Passaic River Basin

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This report cites results of a technical investigation as to the dam's adequacy. The inspection and evaluation of the dam is as prescribed by the National Dam Inspection Act, Public Law 92-367. The technical investigation includes visual inspection, review of available design and construction records, and preliminary structural and hydraulic and hydrologic calculations, as applicable. An assessment of the dam's general condition is included in the report.

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SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

DEPARTMENT OF THE ARMY
PHILADELPHIA DISTRICT, CORPS OF ENGINEERS
CUSTOM HOUSE - 2 D & CHESTNUT STREETS
PHILADELPHIA, PENNSYLVANIA 19106

IN REPLY REFER TO
NAPEN-N

27 JUL 1971

Honorable [illegible] Byrne
Governor of New Jersey
Trenton, New Jersey 08625

Dear Governor Byrne:

Inclosed is the Phase I Inspection Report for Cedar Lake Dam in Morris County, New Jersey which has been prepared under authorization of the Dam Inspection Act, Public Law 92-367. A brief assessment of the dam's condition is given in the front of the report.

Based on visual inspection, available records, calculations and past operational performance, Cedar Lake Dam, initially listed as a high hazard potential structure but reduced to a significant hazard potential structure as a result of this inspection, is judged to be in good overall condition and the spillway is considered adequate. To ensure the adequacy of the structure the following remedial actions are recommended:

a. Within one year from the date of approval of this report the owner should initiate a program of monitoring the observed seepage on a periodic basis by a professional engineer experienced in the design and construction of dams in order to detect any changes in condition.

b. The following actions should be completed within one year from the date of approval of this report:

(1) The spillway discharge culvert should be properly repaired or replaced.

(2) Soil on the downstream side of the embankment should be properly compacted and stabilized.

(3) Tree and adverse vegetation on the embankment should be removed.

c. The owner of the dam should develop written operating procedures and a definite maintenance plan to ensure the safety of the dam.

NAPEN-N
Honorable Brendan T. Byrne

A copy of the report is being furnished to Mr. Dirk C. Hofman, New Jersey Department of Environmental Protection, the designated State Office contact for this program. Within five days of the date of this letter, a copy will also be sent to Congressman Courter of the Thirteenth District. Under the provision of the Freedom of Information Act, the inspection report will be subject to release by this office, upon request, five days after the date of this letter.

Additional copies of this report may be obtained from the National Technical Information Services (NTIS), Springfield, Virginia 22161 at a reasonable cost. Please allow four to six weeks from the date of this letter for NTIS to have copies of the report available.

An important aspect of the Dam Inspection Program will be the implementation of the recommendations made as a result of the inspection. We accordingly request that we be advised of proposed actions taken by the State to implement our recommendations.

Sincerely,

ROGER T. BALDWIN
Lieutenant Colonel, Corps of Engineers
Commander and District Engineer

1 Incl
As stated

Copies furnished:
Mr. Dirk C. Hofman, P.E., Deputy Director
Division of Water Resources
N.J. Dept. of Environmental Protection
P.O. Box CN029
Trenton, NJ 08625

Mr. John O'Dowd, Acting Chief
Bureau of Flood Plain Regulation
Division of Water Resources
N.J. Dept. of Environmental Protection
P.O. Box CN029
Trenton, NJ 08625

CEDAR LAKE DAM (NJ00007)

CORPS OF ENGINEERS ASSESSMENT OF GENERAL CONDITION

This dam was inspected on 15 December 1980 and 2 March 1981 by Storch Engineers under contract to the State of New Jersey. The State, under agreement with the U.S. Army Engineer District, Philadelphia, had this inspection performed in accordance with the National Dam Inspection Act, Public Law 92-367.

Cedar Lake Dam, initially listed as a high hazard potential structure but reduced to a significant hazard potential structure as a result of this inspection, is judged to be in good overall condition and the spillway is considered adequate. To ensure the adequacy of the structure the following remedial actions are recommended:

a. Within one year from the date of approval of this report the owner should initiate a program of monitoring the observed seepage on a periodic basis by a professional engineer experienced in the design and construction of dams in order to detect any changes in condition.

b. The following actions should be completed within one year from the date of approval of this report:

(1) The spillway discharge culvert should be properly repaired or replaced.

(2) Soil on the downstream side of the embankment should be properly compacted and stabilized.

(3) Trees and adverse vegetation on the embankment should be removed.

(4) The owner of the dam should develop written operating procedures and a periodic maintenance plan to ensure the safety of the dam.

APPROVED: Roger T. Baldwin

ROGER T. BALDWIN
Lieutenant Colonel, Corps of Engineers
Commander and District Engineer

DATE: 27 May 81

PHASE I REPORT
NATIONAL DAM SAFETY PROGRAM

Name of Dam:	Cedar Lake Dam, NJ00805
State Located:	New Jersey
County Located:	Morris
Drainage Basin:	Passaic River
Stream:	Tributary to Rockaway River
Dates of Inspection:	December 18, 1980
	March 12, 1981

Assessment of General Condition of Dam

Based on available records, past operational performance, visual inspections and Phase I engineering analysis, Cedar Lake Dam is assessed as being in good overall condition.

Based on investigations of the downstream flood plain made in connection with this report, it is recommended that the hazard potential classification be downgraded from high to significant hazard.

The spillway is capable of passing the designated spillway design flood (100-year storm) without an overtopping of the dam and, therefore, is assessed as being adequate.

It is recommended that the following remedial measures be undertaken by the owner in the near future:

1) The spillway discharge culvert should be properly repaired or replaced.

2) Soil on the downstream side of the embankment should be properly compacted and stabilized.

3) Trees and adverse vegetation on the embankment should be removed.

The observed seepage should be monitored on a periodic basis by a professional engineer experienced in the design and construction of dams in order to detect any changes in condition.

In the future, the owner of the dam should develop written operating procedures and a periodic maintenance plan to ensure the safety of the dam.

Richard J. McDermott, P.E.

John E. Gribbin, P.E.

OVERVIEW - CEDAR LAKE DAM

20 JANUARY 1981

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PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. It is important to note that the condition of dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that the unsafe conditions be detected.

Phase I inspections are not intended to provide detailed hydraulic and hydrologic analyses. In accordance with the established Guidelines, the Spillway Test flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. The test flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydraulic and hydrologic studies, considering the size of the dam, its general condition and the downstream damage potential.

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

CEDAR LAKE DAM, I.D. NJ00805

SECTION 1: PROJECT INFORMATION

1.1 General

a. Public Law 92-367, August 8, 1972, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a National Program of Dam Inspection throughout the United States. The Division of Water Resources of the New Jersey Department of Environmental Protection (NJDEP) in cooperation with the Philadelphia District of the Corps of Engineers has been assigned the responsibility of supervising the inspection of dams within the State of New Jersey. Storch Engineers has been retained by the NJDEP to inspect and report on a selected group of these dams. The NJDEP is under agreement with the Philadelphia District of the Corps of Engineers.

b. Purpose of Inspection

The visual inspections of Cedar Lake Dam were made on December 19, 1980 and March 12, 1981. The purpose of the inspections were to make a general assessment of the structural integrity and operational adequacy of the dam structure and its appurtenances.

1.2 Description of Project

a. Description of Dam and Appurtenances

The dam consists of an earth embankment with a paved roadway extending along its crest. A portion of the upstream side is formed by a timber wall. The spillway consists of timber stoplogs fitted in a concrete headwall and discharges through a corrugated metal culvert. A system of timber docks and walkway is located along the upstream side.

The invert elevation of the intake end of the discharge culvert is 537.0, National Geodetic Vertical Datum (N.G.V.D.) while that of the outlet invert is 533.4. The crest of the dam is at elevation 542.2 and the downstream channel bed is 530.1. The overall length of the dam is 250 feet and its height is 13.0 feet.

b. Location

Cedar Lake Dam is located in the Township of Denville, Morris County, New Jersey. Principal access to the dam is through a residential development which is entered from Diamond Spring Road. Discharge from the spillway of the dam flows into the Rockaway River.

c. Size and Hazard Classification

The dam is classified in accordance with criteria presented in "Recommended Guidelines for Safety Inspection of Dams" published by the U.S. Army Corps of Engineers. Size categories consist of Small, Intermediate and Large while hazard categories are designated as Low, Significant and High.

Size Classification: Cedar Lake Dam is classified as "Small" size since its maximum storage volume is 772 acre-feet (which is less than 1000 acre-feet) and its height is 13.0 feet (which is less than 40 feet).

Hazard Classification: Visual inspection of the downstream flood plain of the dam indicates that failure of the dam due to overtopping could result in damage to a public road bridge (Diamond Spring Road) located 3000 feet from the dam but would not cause significant inundation of two dwellings located about 3200 feet from the dam. Loss of more than a few lives is not anticipated. Accordingly, Cedar Lake Dam is classified as "Significant" hazard.

d. Ownership

Cedar Lake Dam is privately owned by the Cedar Lake Property Owners Inc., 11 Bald Nob Road, Denville, New Jersey 07834.

e. Purpose of Dam

The purpose of the dam is the impoundment of a lake used for recreation.

f. Design and Construction History

Cedar Lake Dam reportedly was constructed in or about 1925. In 1977 a new outlet structure was constructed. Then, in 1980, reportedly, concrete was added to the area of the outlet pipe.

g. Normal Operational Procedures

The dam and its appurtenances are repaired on an "as needed" basis. The water level in the lake is usually lowered once or twice a year by means of stoplogs. The lake was recently dredged in the fall of 1980.

1.3 Pertinent Data

a.	Drainage Area	0.46 square miles
b.	Discharge at Damsite	
	Maximum flood at damsite	Unknown
	Outlet Works at pool elevation	N.A.
	Spillway capacity at top of dam	37 cfs
c.	Elevation (N.G.V.D.)	
	Top of Dam	542.2
	Maximum pool-design surcharge	540.7
	Spillway crest	537.0 to 539.8, varies with use of stoplogs
	Stream bed at toe of dam	530.1
	Maximum tailwater	531 (Estimated)
d.	Reservoir	
	Length of maximum pool	4800 feet (Estimated)
	Length of recreation pool	4300 feet (Scaled)
e.	Storage (Acre-feet)	
	Recreation pool	492
	Design surcharge	599
	Top of dam	772
f.	Reservoir Surface (acres)	
	Top of dam	119 (Estimated)
	Maximum pool - design surcharge	117 (Estimated)
	Recreation pool	89.1

g. Dam

Type	Earthfill
Length	250 feet
Height	13.0 feet
Sideslopes - Upstream	1 horiz. to 1 vert.
- Downstream	2 horiz. to 1 vert.
Zoning	Unknown
Impervious core	Unknown
Cutoff	Unknown
Grout curtain	Unknown

h. Diversion and Regulating Tunnel — N.A.

i. Spillway

Type	Sharp Crested Weir
Width	3.0 feet
Crest elevation	Varies by use of stoplogs
Invert elevation (Discharge Culvert)	537.0
Gates	Timber Stoplogs
Approach channel	N.A.
Discharge channel	Spillway discharges into 36-inch culvert

j. Regulating Outlet

None known

SECTION 2: ENGINEERING DATA

2.1 Design

No plans or calculations pertaining to the original design of the dam could be obtained.

2.2 Construction

No data or reports pertaining to the construction of the dam are available.

2.3 Operation

No data or reports pertaining to the operations of the dam are available.

2.4 Evaluation

a. Availability

There is no available engineering data pertaining to the original construction of the dam.

b. Adequacy

Available engineering data pertaining to Cedar Lake Dam is not adequate to be of significant assistance in the performance of a Phase I evaluation. A list of absent information is included in paragraph 7.1.b.

c. Validity

The validity of engineering data cannot be assessed due to the absence of data.

SECTION 3: VISUAL INSPECTION

3.1 Findings

a. General

The inspections of Cedar Lake Dam was performed on December 19, 1980 and March 12, 1981 by staff members of Storch Engineers. A copy of the visual inspection check list is contained in Appendix 1. The following procedures were employed for the inspection:

1) The embankment of the dam, appurtenant structures and adjacent areas were examined.
2) The embankment and accessible appurtenant structures were measured and key elevations determined by surveyor's level.
3) The embankment, appurtenant structures and adjacent areas were photographed.
4) The downstream flood plain was toured to evaluate downstream development and restricting structures.

b. Dam

The paved roadway on the crest was in satisfactory condition. The timber docks and boardwalk area were all in good condition. A chain link fence extending along the upstream side of the roadway was in good condition. Immediately upstream from the fence decorative shubbery and a few trees ranging in size from 6 inches to 18 inches were observed.

The timber walls forming the upstream side of the dam above the water line were in good condition. The downstream side of the dam was very irregular and consisted of an earth slope with trees, bushes and boulders. Also, fill was observed

placed in a somewhat random configuration on both the right and left sides of the downstream channel. Several large boulders were observed on the downstream side of the dam on both sides of the discharge culvert and in the downstream channel within 15 feet of the culvert. The boulders appeared to have been placed haphazardly resulting in voids in the soil matrix.

Riprap was observed on the upstream side of the dam immediately adjacent to the spillway.

b. Appurtenant Structures

The concrete headwall in which the stoplogs were fitted was in satisfactory condition. One stoplog was in place on December 19, 1980 and four on March 12, 1981. The lake was lowered 0.7 feet below the concrete sill upon which the stoplogs rest on December 19, 1980 apparently by pumping. On March 12, 1981, the lake level was at the top of the first stoplog. The stoplogs and rubber seals were in generally satisfactory condition.

The spillway discharge culvert appeared to be composed of a 36-inch cast iron pipe at the upstream end and a 36-inch corrugated metal pipe at the downstream end. Its alignment was such that about one-third of its cross sectional area provided unobstructed vision when viewed from one end. The invert at the downstream end was severely rusted with a portion 12 inches wide rusted through. On March 12, 1981, the deteriorated invert was paved with mortar.

c. Seepage

A small amount of seepage was visible at the toe of dam in the area of the spillway outlet and in the bed of the downstream channel. The seepage was emerging from under the boulders

which are immediately downstream from the spillway outlet. The movement of water was very slight and orange colored deposits were observed in the water.

Downstream Channel

The downstream channel is a small meandering stream with a bed lined with cobbles. The banks are approximately 4 feet high and the stream is wooded along both sides.

A road bridge (Diamond Spring Road) is located approximately 3000 feet downstream from the dam.

Reservoir Area

The reservoir appeared to be completely surrounded by home sites and the home sites had appurtenant structures, such as docks and walls around the lake. The shores of the lake were very steep and wooded around the houses. The slope of the shores was approximately 50 percent or greater.

SECTION 4: OPERATIONAL PROCEDURES

4.1 Procedures

The level of water in Cedar Lake is regulated by discharge over the stoplogs of the spillway and through the discharge culvert. The lake reportedly is lowered each year by removing stoplogs. At the time of inspection on December 19, 1980, the lake level was below the lowest stoplog, apparently due to pumping, reportedly for the purpose of lake dredging.

The stoplogs reportedly are not removed at times of storms to augment spillway capacity.

4.2 Maintenance of the Dam

Reportedly, regular maintenance of the dam is performed on an "as needed" basis. The dam is inspected yearly when the lake is at its lower stage.

4.3 Maintenance of Operating Facilities

Reportedly, regular maintenance of operating facilities is performed on an "as needed" basis. Reportedly, the spillway was renovated in or about 1977 and in 1980 additional repairs were made by the addition of mortar around the outlet pipe.

The inspection on March 12, 1981 revealed that the deteriorated invert of the downstream end of the discharge culvert had been repaired with mortar.

4.4 Description of Warning System

Reportedly, no warning system is currently in use for the dam although the Township of Denville is notified when the lake is lowered.

4.5 Evaluation of Operational Adequacy

The operation of the dam has been successful to the extent that the dam reportedly has not been overtopped.

Although maintenance documentation is poor, maintenance of the dam and operating facilities appears to have been generally adequate.

Areas of maintenance that have not been adequately performed are:

1) The repair to the CMP spillway discharge culvert was not sufficient to arrest further deterioration in the future.
2) Trees and adverse vegetation on the embankment have not been removed.

SECTION 5: HYDRAULIC/HYDROLOGIC

5.1 Evaluation of Features

a. Design Data

The quantity of storm water runoff that the spillway should be able to handle is based on the size and hazard classification of the dam. This runoff quantity, called the spillway design flood (SDF), is described in terms of return frequency or probable maximum flood (PMF) depending on the extent of the dam's size and potential hazard. According to the "Recommended Guidelines for Safety Inspection of Dams" published by the U.S. Army Corps of Engineers, the SDF for Cedar Lake Dam falls in a range of 100-year frequency to 1/2 PMF. In this case, the low end of the range, 100-year frequency, is chosen since the factors used to select size and hazard classification are on the low side of their respective ranges.

The SDF peak computed for Cedar Lake Dam is 799 c.f.s. This value is derived from the 100-year flood hydrograph computed by the use of the HEC-1-DAM Flood Hydrograph Computer Program using the Soil Conservation Service triangular unit hydrograph method with cuvilinear transformation. Hydrologic computations and computer output are contained in Appendix 4.

The spillway discharge rates were computed by the use of culvert capacity charts assuming inlet control. It was assumed that the discharge culvert would control outflow during the SDF. The total spillway discharge with lake level equal to the top of the dam was computed to be 37 c.f.s. The SDF was routed through the dam by use of the HEC-1-DAM computer program using the modified Puls Method. In routing the SDF, it was found that the dam crest would not be overtopped with 1.5 feet of freeboard remaining. Accordingly, the subject spillway is assessed as being adequate in accordance with criteria developed by the U.S. Army Corps of Engineers.

b. Experience Data

Reportedly, the dam has never been overtopped. No damage to downstream structures has been reported.

c. Visual Observation

No evidence of overtopping of the embankment was noted at the times of inspection.

d. Overtopping Potential

According to the hydrologic and hydraulic analyses, a storm of intensity equivalent to the SDF will pass through the spillway with an estimated freeboard of 1.5 feet.

e. Drawdown Data

Drawdown calculations could not be performed due to the apparent absence of outlet works.

SECTION 6: STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability

a. Visual Observations

Seepage was observed at the downstream toe of dam at the spillway outlet. Also, voids in the soil behind the boulders at the downstream end of the spillway discharge culvert were observed. The observed seepage and soil voids however, did not appear to be an indication of immediate structural instability.

b. Generalized Soils Description

The generalized soils description of the dam site consists of silt, sandy silt, sandy gravel, varying amounts of pebbles, cobbles and boulders derived from gneiss bedrock with appreciable amounts of clay in depressions.

c. Design and Construction Data

Analysis of structural stability and construction data for the embankment are not available.

d. Operating Records

No operating records are available for the dam. The water level of Cedar Lake is not monitored.

e. Post-Construction Changes

In 1977 reportedly, a new outlet structure was constructed, and in 1980 new concrete was placed around the outlet pipe. Reportedly, the lake was dredged during the fall of 1980.

f. Seismic Stability

Cedar Lake Dam is located in Seismic Zone 1 as defined in "Recommended Guidelines for Safety Inspection of Dam" which is a zone of very low seismic activity. Experience indicates that dams in seismic Zone 1 will have adequate stability under seismic loading conditions if they have adequate stability under static loading conditions. Cedar Lake Dam appeared to be outwardly stable under static loading conditions at the times of inspection.

SECTION 7: ASSESSMENT AND RECOMMENDATIONS

7.1 Dam Assessment

a. Safety

Based on hydraulic and hydrologic analyses outlined in Section 5 and Appendix 4, the spillway of Cedar Lake Dam is assessed as being adequate. The spillway is able to pass the SDF without an overtopping of the dam.

The embankment appeared, at the time of inspection, to be outwardly stable. However, evidence of possible distress was observed. The evidence consisted of seepage and soil voids on the downst-eam side.

b. Adequacy of Information

Information sources for this report include 1) field inspections, 2) USGS quadrangle, 3) consultation with Mrs. C. E. Barnes of the Cedar Lake Property Owners Association. The information obtained is sufficient to allow a Phase I assessment as outlined in "Recommended Guidelines for Safety Inspection of Dams."

Some of the absent data are as follows:

1. Construction and as-built drawings.
2. Description of fill material for embankment.
3. Design computations and reports.
4. Maintenance documentation.
5. Soils report for the site.
6. Post construction engineering reports.

c. Necessity for Additional Data/Evaluation

Although some data pertaining to Cedar Lake Dam are not available, additional data are not considered imperative for this Phase I evaluation.

7.2 Recommendations

a. Remedial Measures

Based on hydraulic and hydrologic analyses outlined in paragraph 5.1.a, the spillway is considered to be adequate.

It is recommended that the following remedial measures be undertaken by the owner in the near future.

1) The spillway discharge culvert should be properly repaired or replaced.

2) Soil on the downstream side of the embankment should be properly compacted and stabilized.

3) Trees and adverse vegetation on the embankment should be removed.

b. Maintenance

In the future, the owner of the dam should develop written operating procedures and a periodic maintenance plan to ensure the safety of the dam.

c. Additional Studies

The observed seepage should be monitored on a periodic basis by a professional engineer experienced in the design and construction of dams in order to detect any changes in condition.

PLATES

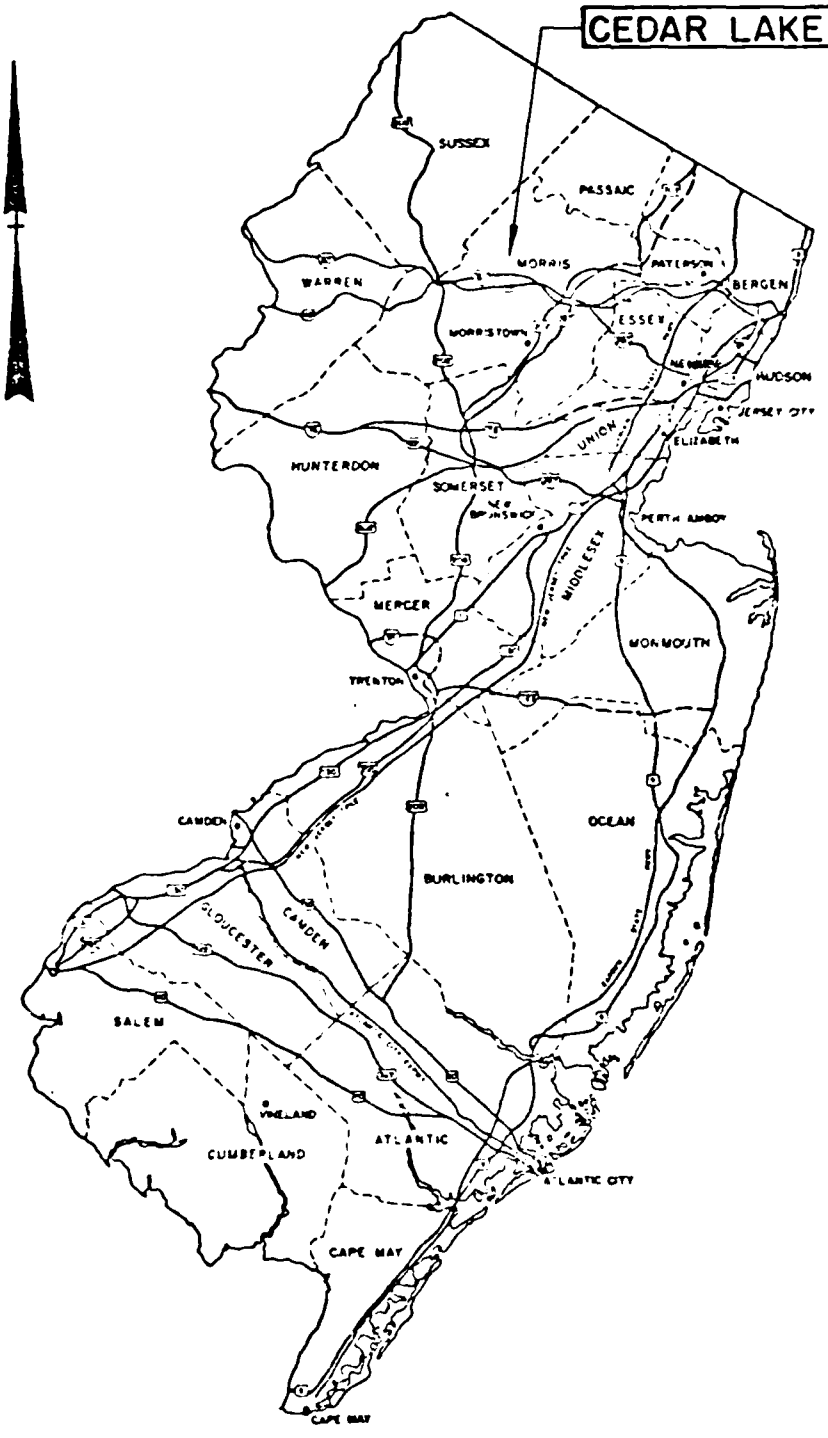


PLATE 1

STORCH ENGINEERS FLORHAM PARK, NEW JERSEY	INSPECTION AND EVALUATION OF DAMS KEY MAP CEDAR LAKE DAM
DIVISION OF WATER RESOURCES N.J. DEPT. OF ENVIR. PROTECTION TRENTON, NEW JERSEY	SCALE: NONE DATE: FEB. 1981

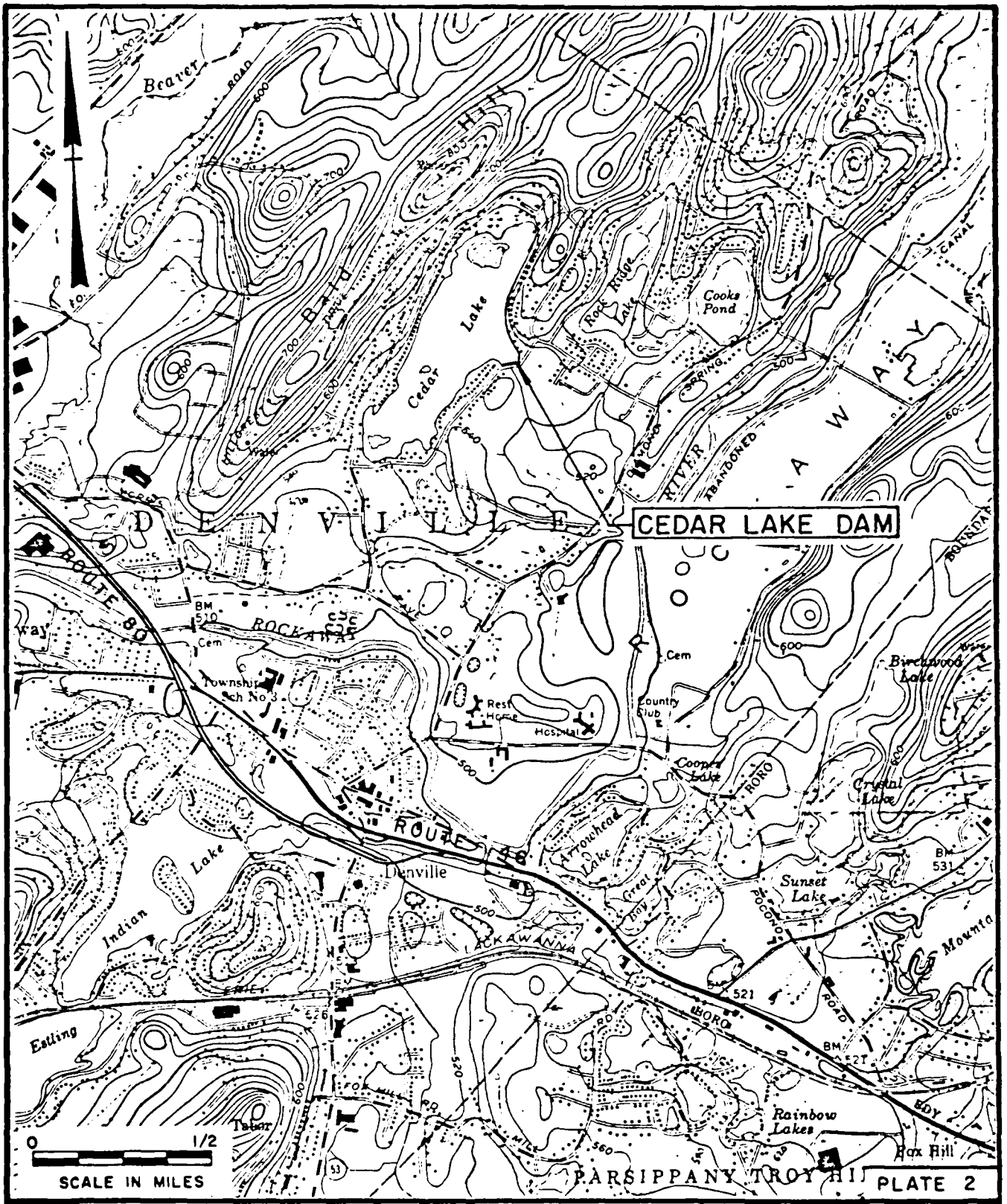


PLATE 2

STORCH ENGINEERS
FLORHAM PARK, NEW JERSEY

DIVISION OF WATER RESOURCES
N.J. DEPT. OF ENVIR. PROTECTION
TRENTON, NEW JERSEY

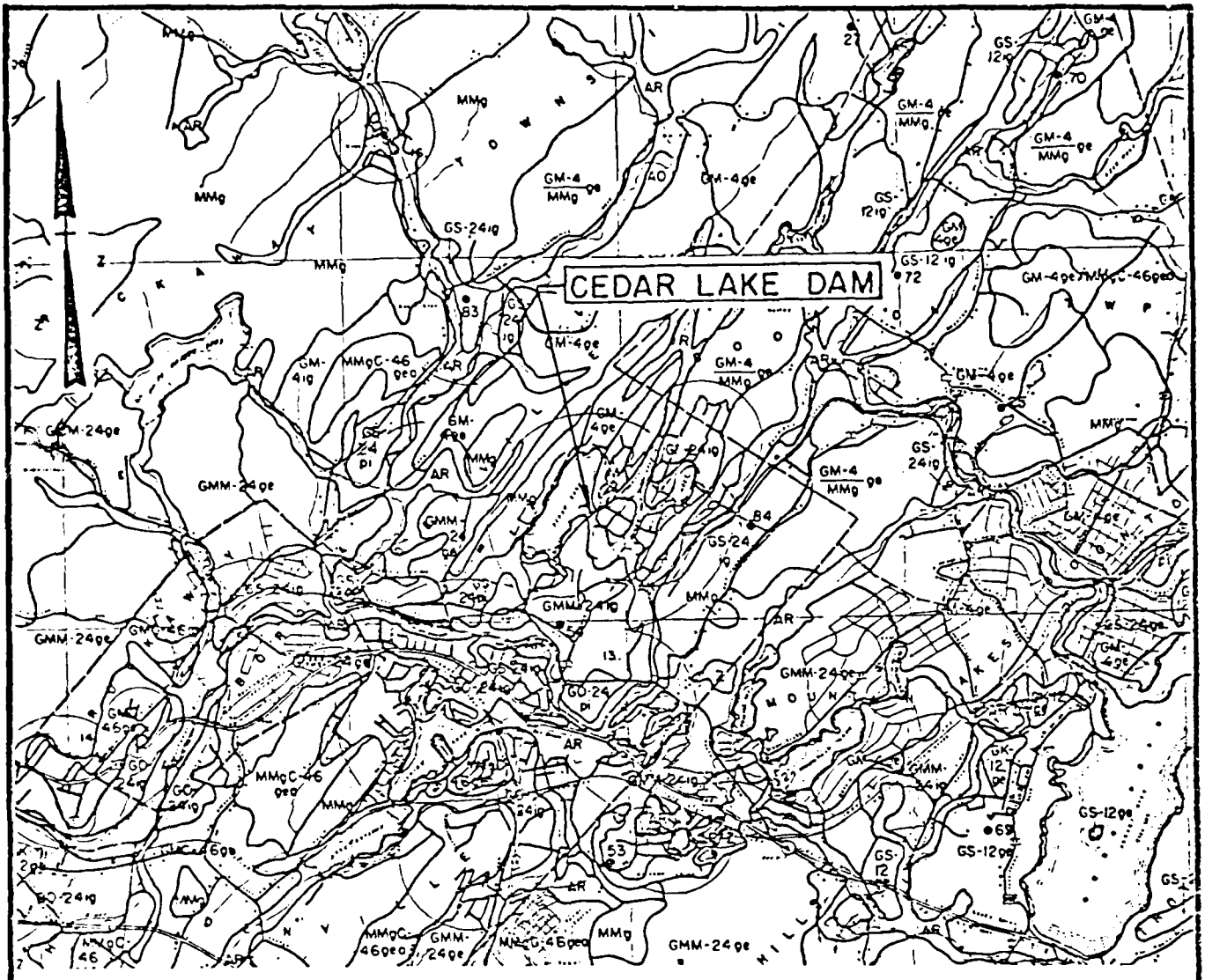
INSPECTION AND EVALUATION OF DAMS

VICINITY MAP

CEDAR LAKE DAM

SCALE: AS SHOWN

DATE: FEB. 1981



Legend

GMM-24 — Silt, sandy silt, sandy gravel, gravelly sand, with appreciable amounts of clay in depressions.

MMg — Silt, silty sand with a varying amount of pebbles, cobbles and boulders derived from gneiss rock.

Note: Information taken from: Rutgers University Engineering Soil Survey of New Jersey, Report No. 9, Morris County, November 1953 and Geologic Map of New Jersey prepared by J. V. Lewis and H. Kummel 1910-1912, revised by H. B. Kummel 1931 and M. Johnson 1950.

PLATE 3

STORCH ENGINEERS
FLORHAM PARK, NEW JERSEY.

DIVISION OF WATER RESOURCES
N.J. DEPT. OF ENVIR. PROTECTION
TRENTON, NEW JERSEY

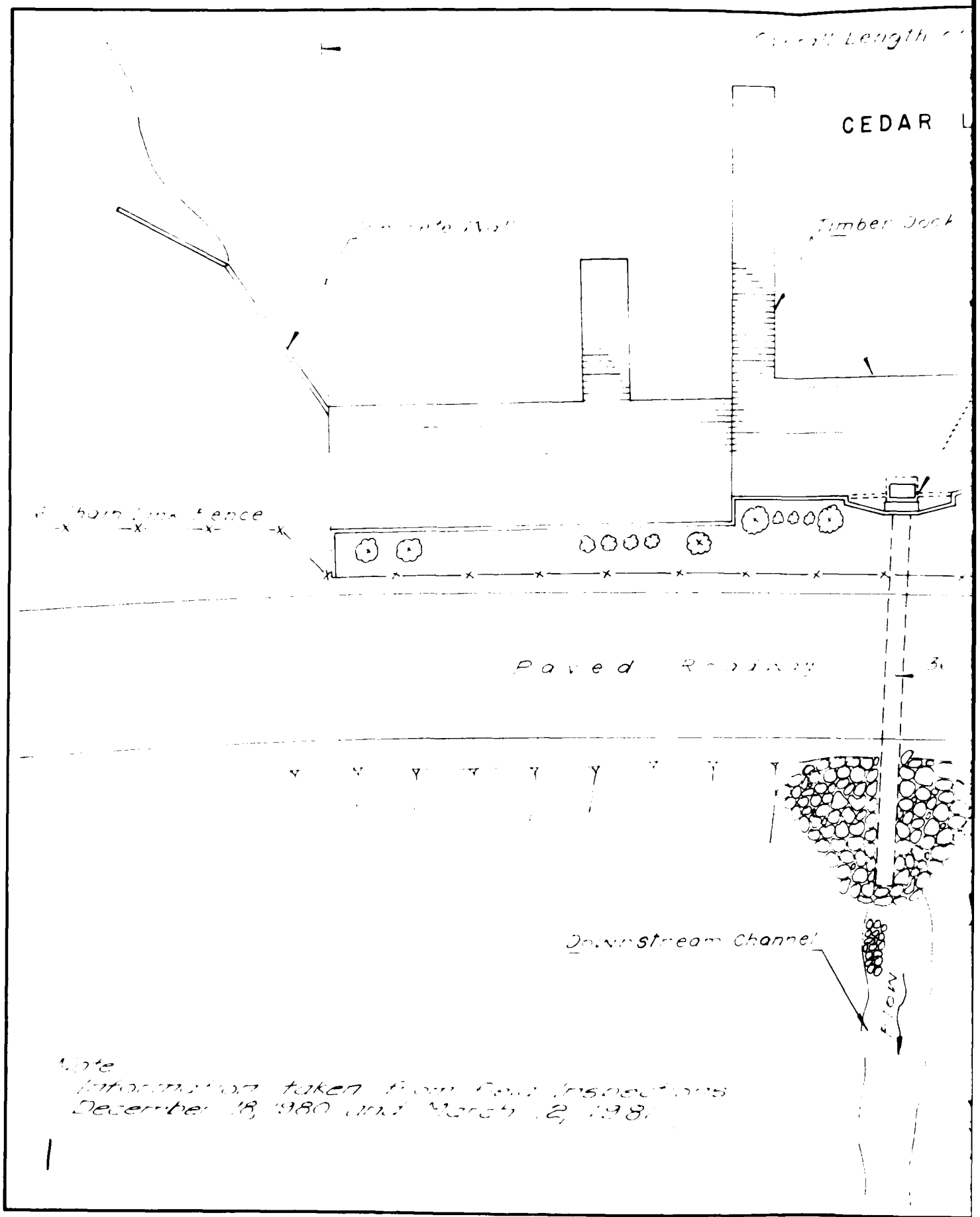
INSPECTION AND EVALUATION OF DAMS

SOIL MAP

CEDAR LAKE DAM

SCALE: NONE

DATE: FEB. 1981



Note
Information taken from field inspections
December 19, 1980 and March 2, 1981

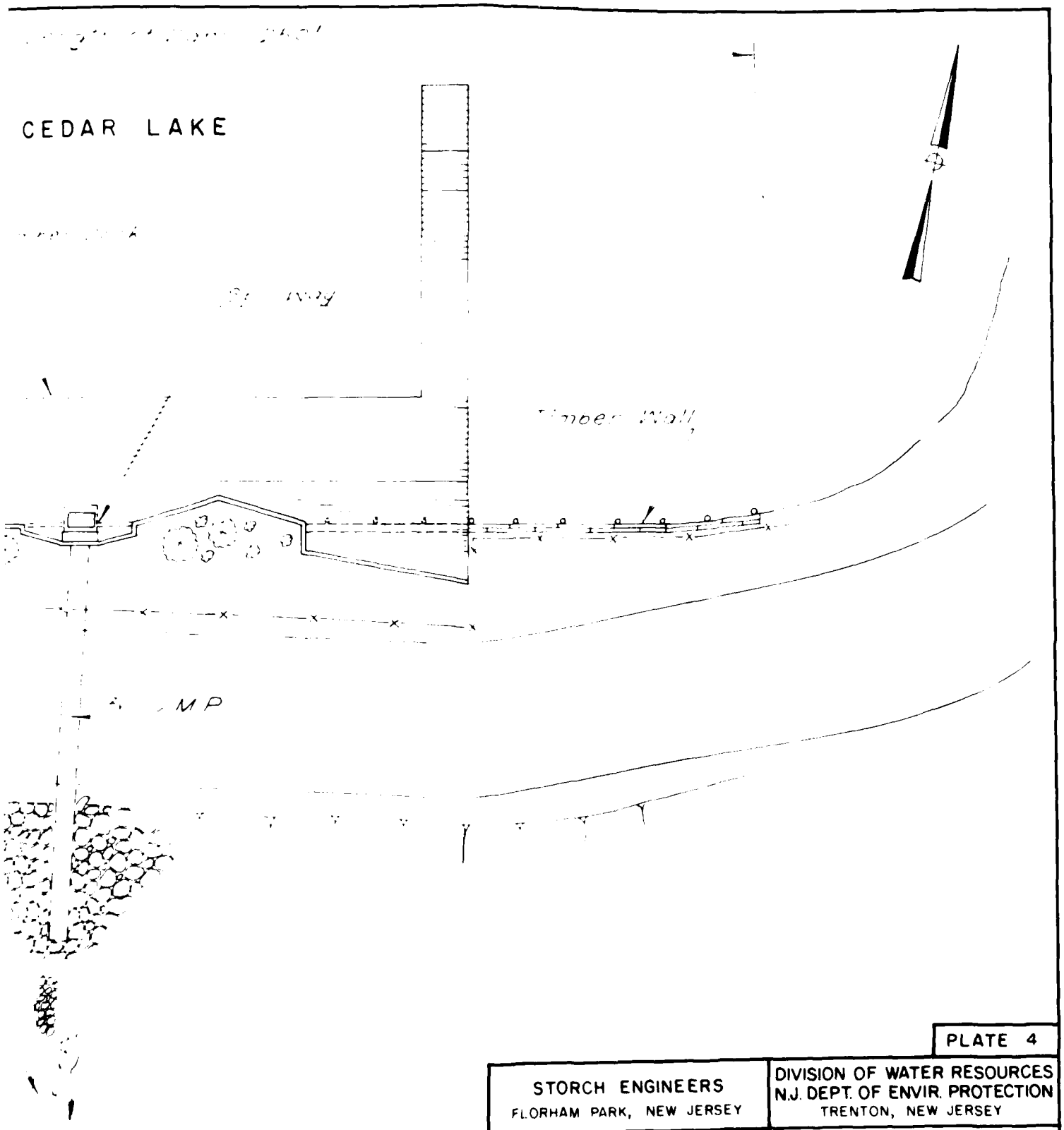


PLATE 4

STORCH ENGINEERS FLORHAM PARK, NEW JERSEY	DIVISION OF WATER RESOURCES N.J. DEPT. OF ENVIR. PROTECTION TRENTON, NEW JERSEY

INSPECTION AND EVALUATION OF DAMS

GENERAL PLAN

CEDAR LAKE DAM

ID NJ 00805	SCALE NOT TO SCALE
	DATE MARCH, 1981

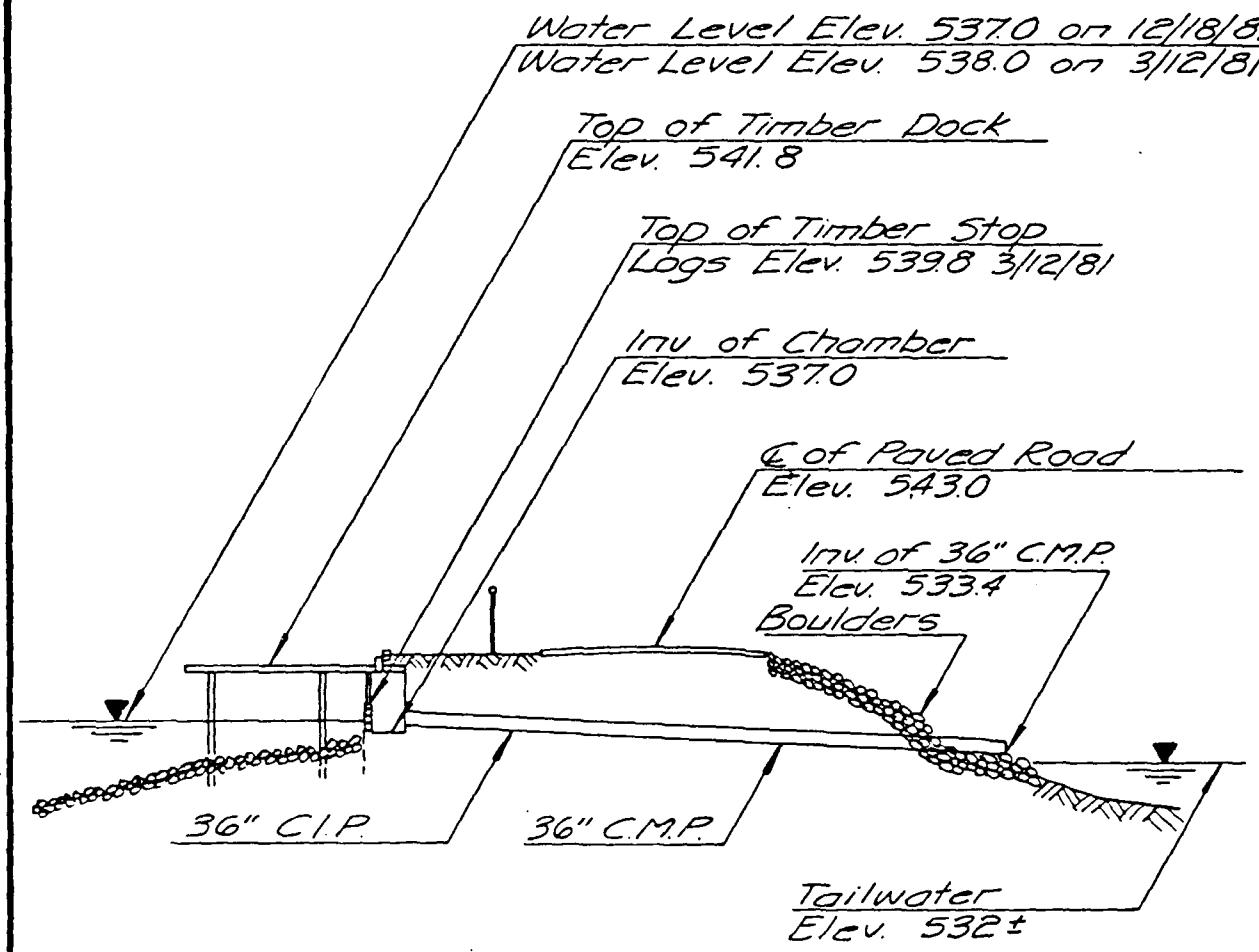
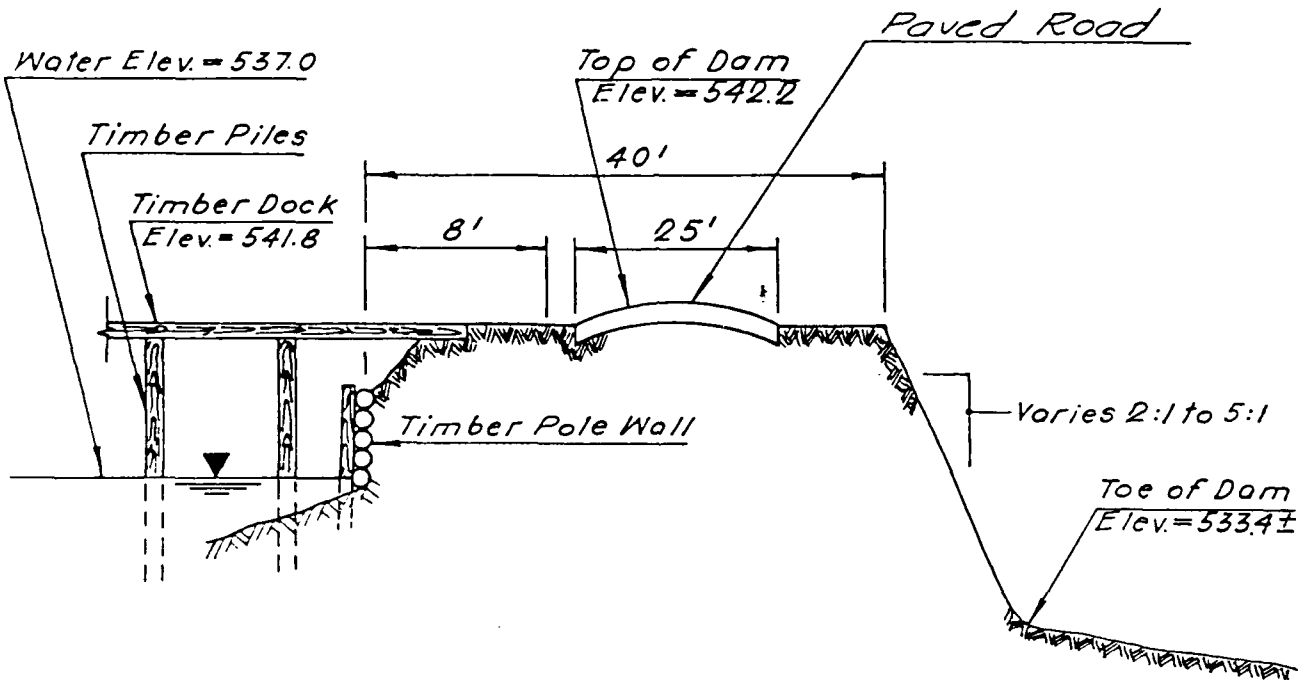


PLATE 5

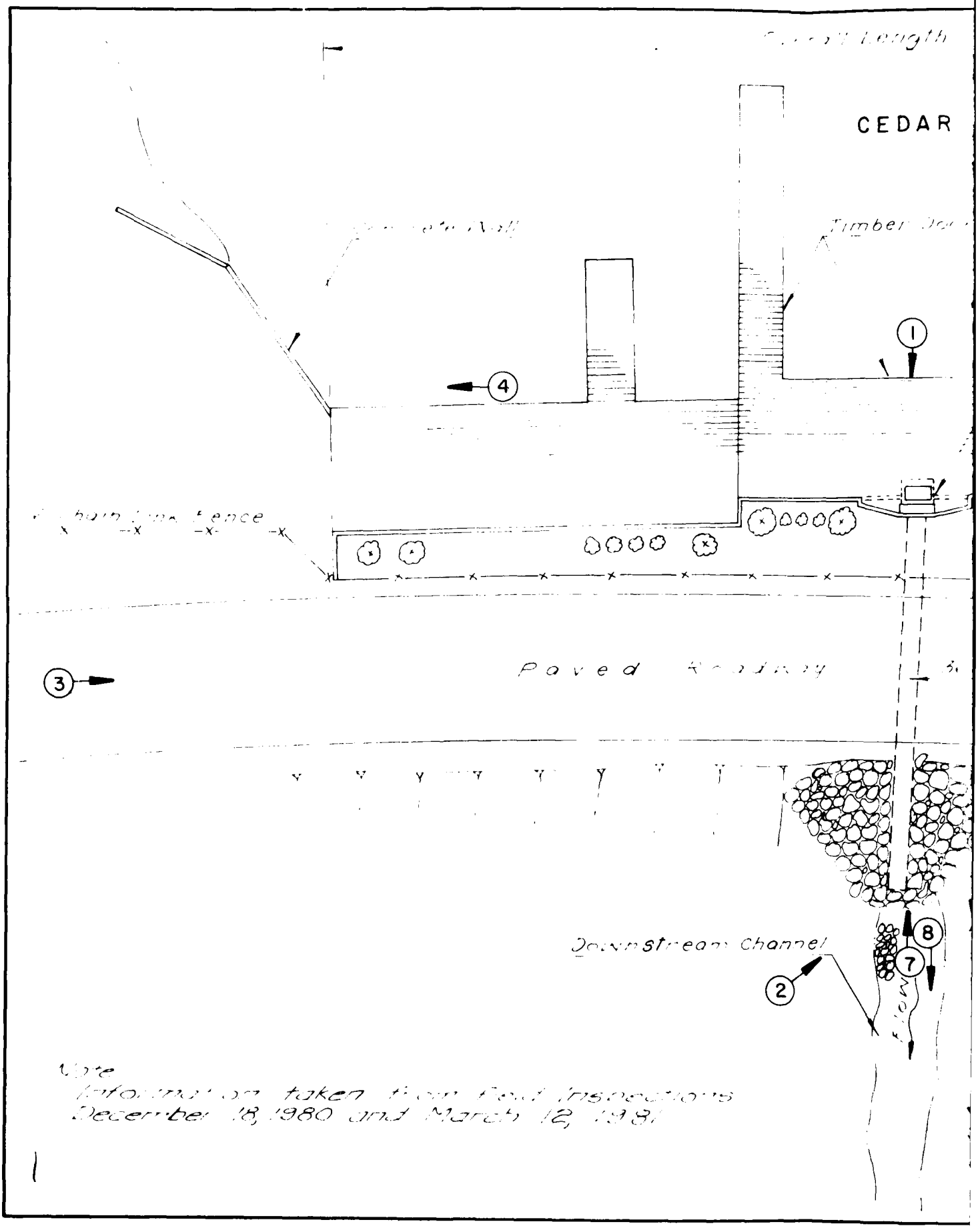
STORCH ENGINEERS FLORHAM PARK, NEW JERSEY	INSPECTION AND EVALUATION OF DAMS SPILLWAY SECTION CEDAR LAKE DAM
DIVISION OF WATER RESOURCES N.J. DEPT. OF ENVIR. PROTECTION TRENTON, NEW JERSEY	I.D. NJ 00805 | SCALE: NONE DATE: MARCH, 1981



DAM SECTION

PLATE 6

STORCH ENGINEERS FLORHAM PARK, NEW JERSEY	INSPECTION AND EVALUATION OF DAMS TYPICAL DAM SECTION CEDAR LAKE DAM
DIVISION OF WATER RESOURCES N.J. DEPT. OF ENVIR. PROTECTION TRENTON, NEW JERSEY	ID NJ 00805 | SCALE: NONE DATE: MARCH, 1981



Note
Information taken from field inspections
December 18, 1980 and March 12, 1981

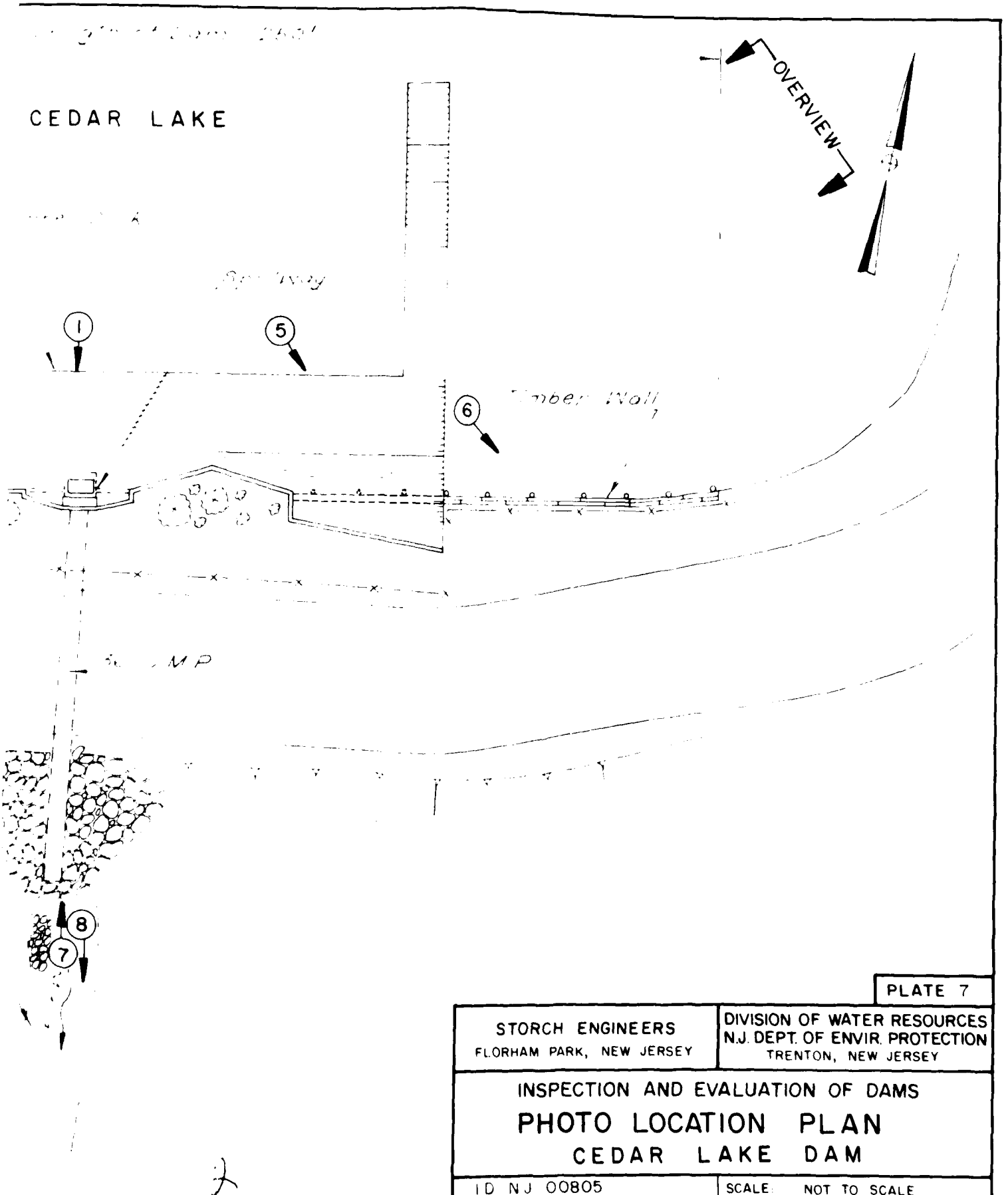


PLATE 7

STORCH ENGINEERS FLORHAM PARK, NEW JERSEY	DIVISION OF WATER RESOURCES N.J. DEPT. OF ENVIR. PROTECTION TRENTON, NEW JERSEY

INSPECTION AND EVALUATION OF DAMS

PHOTO LOCATION PLAN

CEDAR LAKE DAM

ID NJ 00805	SCALE: NOT TO SCALE
	DATE: MARCH, 1981

APPENDIX 1

Check List - Visual Inspection

Check List - Engineering Data

Check List

Visual Inspection

Phase I

Name of Dam Cedar Lake Dam County Morris State N.J. Coordinators N.J. D.E.P.

Date(s) Inspection 12/18/80, 3/12/81 Weather Sunny Temperature 25°F

Pool Elevation at time of Inspection 537.0 (12/18/80), 539.3 (3/12/81) M.S.L. Tailwater at Time of Inspection 530.5 M.S.L.

Inspection Personnel:

John Gribbin, Andrew Polperio

Charles Osterkorn, Richard McDermott

Daniel Buckelew

John Gribbin Recorder

owner not present

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
GENERAL	Timber walls on upstream side in satisfactory condition. Downstream side irregular and covered with trees, bushes and boulders. Random fill placed on downstream side.	Trees and adverse vegetation should be removed.
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	Observed to be in good condition	
ANY NOTICEABLE SEEPAGE	A small amount of seepage was observed at the toe of the embankment near the spillway outlet and in the bed of the downstream channel. Orange colored deposits observed.	Seepage should be monitored on a periodic basis.
STAFF GAGE AND RECORDER	None observed	
DRAINS	None observed	

EMBANKMENT

VISUAL EXAMINATION	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	None observed	
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	None observed	
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	None observed	
VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST	Vertical: varies Horizontal: upstream face- generally curved down stream face-curved and irregular.	
RIPRAP	Riprap observed on the upstream face of the dam immediately adjacent to the spillway. Boulders dumped on downstream side around spillway culvert outlet. Voids in the soil within the boulders observed.	

OUTLET WORKS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE SURFACES IN OUTLET CONDUIT	Not available	No low level outlet observed.
INTAKE STRUCTURE	Not available	
OUTLET STRUCTURE	Not available	
OUTLET CHANNEL	Not available	
GATE AND GATE HOUSING	Not available	

SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
WEIR	Rubber sealed timber stoplogs observed to be in satisfactory condition.	
HEADWALL STRUCTURE	Concrete in satisfactory condition.	
36" CULVERT PIPE	36" CI pipe observed at the upstream end and a 36" CMP pipe at the downstream end. The alignment between the two sections was poor and the C.M.P. was severely rusted on its invert at the downstream end. Deteriorated invert observed to be paved with mortar on 3/12/81.	Discharge culvert should be repaired or replaced.
DISCHARGE CHANNEL	Boulders haphazardly placed downstream of the discharge culvert. Voids observed in the soil behind the boulders.	Soil on the downstream side should be properly compacted and stabilized.
TIMBER DOCKS	Observed to be in good condition.	

INSTRUMENTATION

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
MONUMENTATION/SURVEYS	None	
OBSERVATION WELLS	None	
WEIRS	None	
PIEZOMETERS	None	
OTHER		

RESERVOIR

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	Shores wooded with homesites all around lake. Steep, approx. 50% or greater.	
SEDIMENTATION	Unknown	
STRUCTURES ALONG BANKS	Reservoir completely surrounded by home sites of which the majority had appurtenant structures such as docks and walls. Timber dock structure extends for nearly the entire length of the upstream face of the dam.	

DOWNSTREAM CHANNEL

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTION, DEBRIS, ETC.)	Natural stream with cobble lined bed. Stream wooded on both sides. Road bridge spans channel 3000' downstream from dam.	
SLOPES	Banks approx. 4' high	
STRUCTURES ALONG BANKS	Road bridge (Diamond Spring Road) 3000' downstream from dam. Two dwellings 3200' downstream, approx. 8' above stream bed.	

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION

ITEM			REMARKS
DAM	-	PLAN	Not available
		SECTIONS	
SPILLWAY	-	PLAN	Not available
		SECTIONS	
		DETAILS	
OPERATING EQUIPMENT PLANS & DETAILS			Not available
OUTLETS	-	PLAN	Not available
		DETAILS	
		CONSTRAINTS	
		DISCHARGE RATINGS	
HYDRAULIC/HYDROLOGIC DATA			Not available
RAINFALL/RESERVOIR RECORDS			Not available
CONSTRUCTION HISTORY			Not available
LOCATION MAP			Not available

ITEM	REMARKS
DESIGN REPORTS	Not available
GEOLOGY REPORTS	Not available
DESIGN COMPUTATIONS HYDROLOGY & HYDRAULICS DAM INSTABILITY SEEPAGE STUDIES	Not available
MATERIALS INVESTIGATIONS BORING RECORDS LABORATORY FIELD	Not available
POST-CONSTRUCTION SURVEYS OF DAM	Not available
BORROW SOURCES	Not available

ITEM	REMARKS
MONITORING SYSTEMS	Not available
MODIFICATIONS	New outlet structure constructed in 1977, additional concrete placed around outlet pipe in 1980.
HIGH POOL RECORDS	Not available
POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS	Not available
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS	Not available
MAINTENANCE OPERATION RECORDS	Not available

APPENDIX 2

Photographs

PHOTO 1

INTAKE END OF SPILLWAY

PHOTO 2

OUTLET END OF SPILLWAY

CEDAR LAKE DAM
18 DECEMBER 1980

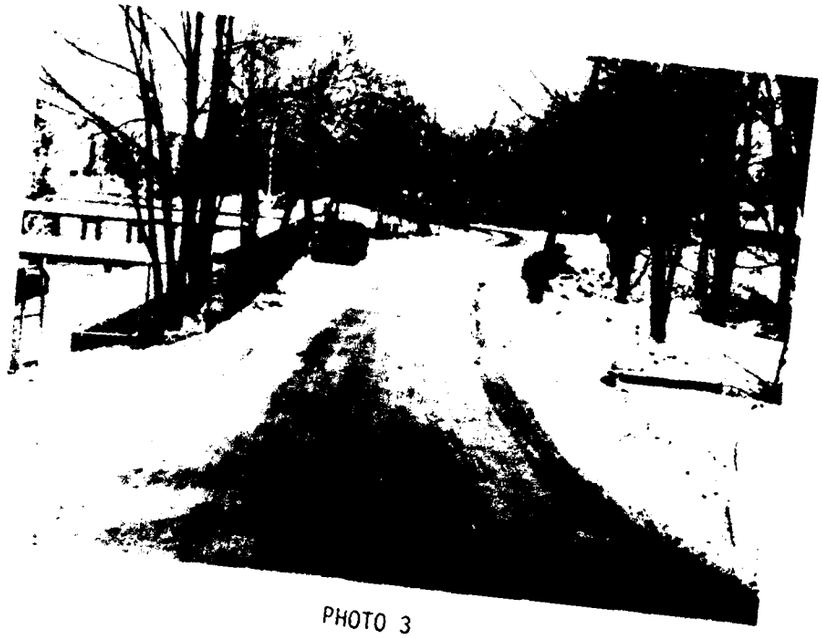


PHOTO 3

CREST OF DAM

PHOTO 4

CONCRETE WALL AT RIGHT END OF DAM

PHOTO 5

TIMBER WALL ON UPSTREAM SIDE OF DAM

PHOTO 6

TIMBER WALL AT LEFT END OF DAM

CEDAR LAKE DAM
18 DECEMBER 1980

PHOTO 7

SEEPAGE AT TOE OF DAM

PHOTO 8

DOWNSTREAM CHANNEL

CEDAR LAKE DAM
18 DECEMBER 1980

APPENDIX 3

Engineering Data

CHECK LIST

HYDROLOGIC AND HYDRAULIC DATA

ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: Residential & wooded

ELEVATION TOP NORMAL POOL (STORAGE CAPACITY): 539.8 (492 acre ft.)

ELEVATION TOP FLOOD CONTROL POOL (STORAGE CAPACITY): N A

ELEVATION MAXIMUM DESIGN POOL: 540.7

ELEVATION TOP DAM: 542.2

SPILLWAY CREST: Controlled Weir (Stoplogs)

a. Elevation Varies with use of stoplogs (537.8 to 539.8)

b. Type Sharp Crested Weir

c. Width 0.25 feet

d. Length 3.0 feet

e. Location Spillover Upstream face of dam

f. Number and Type of Gates Stoplogs

OUTLET WORKS: No low-level outlet

a. Type N.A.

b. Location N.A.

c. Entrance Invert N.A.

d. Exit Invert N.A.

e. Emergency Draindown Facilities: N.A.

HYDOMETEOROLOGICAL GAGES: N.A.

a. Type N.A.

b. Location N.A.

c. Records N.A.

MAXIMUM NON-DAMAGING DISCHARGE:

(Lake Stage Equal to Top of Dam) 37 c.f.s.

APPENDIX 4

Hydraulic/Hydrologic Computations

HYDROLOGY

Hydrologic Analysis:

Runoff hydrograph will be developed by HEC-1-DAM computer program using SCS triangular hydrograph with the curvilinear transformation.

Drainage AREA = 0.46 SQ. MI.

Infiltration Data

Initial Infiltration	1.5 inches
Constant Infiltration	0.15 in/hr.

Time of Concentration (t_c) (Method #1)

By SCS TR-55

Overland Flow:

$L = 2200'$
Δ ELEV. $= 180'$
$S = 8.18\%$
$V = 0.7$ f.p.s.
$t_c =$ 0.87 Hr.

Neglect Channel Flow

Time of Concentration (t_c) (Method #2)

Pg. 14-36 "Handbook of Applied Hydrology" by Chow.

$$T_c^{2.14} = 2/3 \frac{Ln}{\sqrt{S}}$$

T_c = Time of Concentration
L = Length of Flow
S = Slope
n = Roughness Coeff.

Overland Flow:

L = 2200'
S = 0.0818
n = 0.40
t_c = 0.59 Hr.

Neglect Channel Flow

Time of Concentration (t_c) (Method #3)

N.J. Highway Authority Nomograph

Overland Flow:

L = 2200'
S = 8.18 %
Average Grass
t_c = 0.55 Hr.

Neglect Channel Flow

Time of Concentration (t_c) (Method #4)
Texas Highway Dept. "Design of Small Dams" U.S. Dept. of Interior, pg. 70 & Navdocks TP-PW-5

Overland Flow:
$L = 2200'$
$S = 8.18\%$
$V = 3.0$ f.p.s.
$t_c =$ 0.20 Hr.

Neglect Channel Flow

For Computer Input

Use $t_c = 0.60$ hr.

$lag = 0.6\, t_c$
$= (0.6)(0.60)$
$= 0.36$ hr.

PRECIPITATION

24 HOUR, 100 YEAR RAINSTORM

DISTRIBUTION FOR CEDAR LAKE DAM

TIME (Hr.)	Rain (inches)
1	0.075
2	0.075
3	0.075
4	0.075
5	0.075
6	0.075
7	0.075
8	0.075
9	0.075
10	0.075
11	0.075
12	0.075
13	0.15
14	0.15
15	0.15
16	0.33
17	0.65
18	3.00
19	0.65
20	0.33
21	0.33
22	0.15
23	0.15
24	0.15

ELEVATION - AREA TABLE

ELEV. (MSL)	AREA (Ac.)
530	0
537	89.1
540	116.2
560	129.7

HEC-1 - DAM COMPUTER PROGRAM WILL DEVELOP STORAGE CAPACITY FROM SURFACE AREAS & ELEVATIONS.

INFORMATION TAKEN FROM U.S.G.S. QUADRANGLE.

HYDRAULICS

Stage Discharge Calculation:

The spillway at Cedar Lake Dam consists of a 36" C.M.P. transversly penetrating the embankment. Discharge Q, was calculated assuming Inlet control by Chart V of the "Hydraulic Charts for the Selection of Highway Culverts" U.S. Dept. of Commerce.

STORCH ENGINEERS

Project CEDAR LAKE DAM

Sheet 7 of 8

Made By CLO Date 7/2/81

Chkd By JG Date 7/2/81

INLET CONTROL, CHART V**

ELEV.	HW/D	PIPE SIZE	Q (cfs)
539.8	—	36"	0
540.5	—	36"	5.8 *
541.0	—	36"	13 *
541.5	—	36"	22 *
542.2	—	36"	37 *
543.0	—	36"	57 *
544.0	2.67	36"	82 **

* WEIR FLOW CONTROLS BY THE FORMULA

$Q = CLH^{3/2}$ WHERE: $C = 3.3$

$L = 3.0$ feet

** INLET CONTROL, CHART V FROM "HYDRAULIC CHARTS FOR THE SELECTION OF HIGHWAY CULVERTS," U.S. DEPT OF COMMERCE, BUREAU OF PUBLIC ROADS.

STORCH ENGINEERS

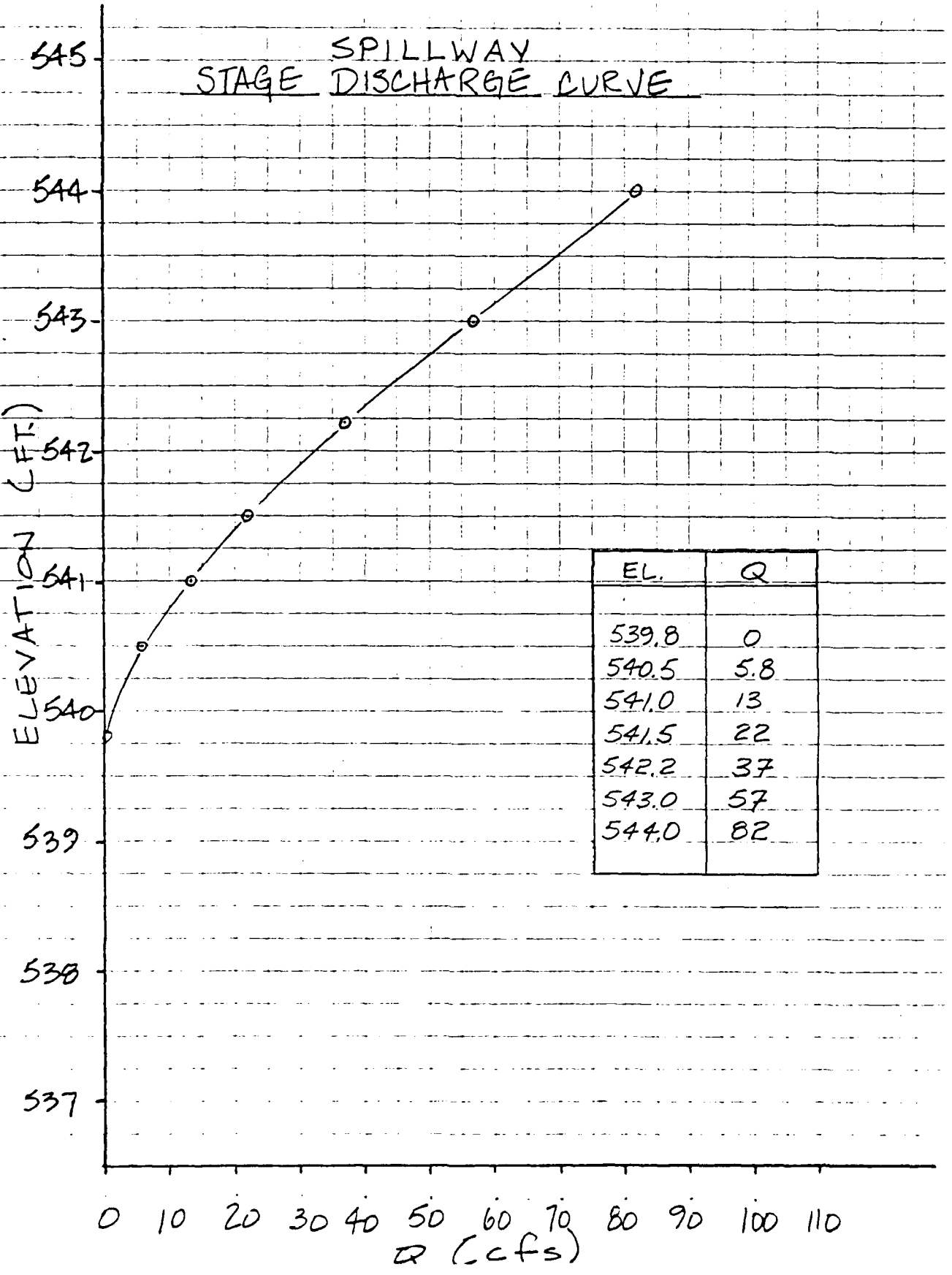
Project CEDAR LAKE DAM

Sheet 8 of 8

Made By CLO Date 7/2/81

Chkd By JG Date 7/2/81

SPILLWAY STAGE DISCHARGE CURVE



EL.	Q
539.8	0
540.5	5.8
541.0	13
541.5	22
542.2	37
543.0	57
544.0	82

HEC - 1 - DAM PRINTOUT

Overtopping Analysis

```
1A1       NATIONAL DAM SAFETY PROGRAM
 A2       CEDAR LAKE DAM, NEW JERSEY
 A3         100 YEAR STORM ROUTING
 B    300        0       12                                    0       0       4
 B1     5
 J      1        1        1
 J1     1
 K      0    LAKE                          0       0       1
 K1         INFLOW HYDROGRAPH TO CEDAR LAKE DAM
 M      0        2    0.46          0.46       0                       1
 O    120
 O1 0.015    0.015    0.015    0.015    0.015    0.015    0.015    0.015    0.015    0.015
 O1 0.015    0.015    0.015    0.015    0.015    0.015    0.015    0.015    0.015    0.015
 O1 0.015    0.015    0.015    0.015    0.015    0.015    0.015    0.015    0.015    0.015
 O1 0.015    0.015    0.015    0.015    0.015    0.015    0.015    0.015    0.015    0.015
 O1 0.015    0.015    0.015    0.015    0.015    0.015    0.015    0.015    0.015    0.015
 O1 0.015    0.015    0.015    0.015    0.015    0.015    0.015    0.015    0.015    0.015
 O1  0.03     0.03     0.03     0.03     0.03     0.03     0.03     0.03     0.03     0.03
 O1  0.03     0.03     0.03     0.03     0.03    0.066    0.066    0.066    0.066    0.066
 O1  0.13     0.13     0.13     0.13     0.13      0.6      0.6      0.6      0.6      0.6
 O1  0.13     0.13     0.13     0.13     0.13    0.066    0.066    0.066    0.066    0.066
 O1 0.066    0.066    0.066    0.066    0.066     0.03     0.03     0.03     0.03     0.03
 O1  0.03     0.03     0.03     0.03     0.03     0.03     0.03     0.03     0.03     0.03
 T                                                  1.5     0.15
 W2           0.36
 X   -1.0    -0.05      2.0
 K      1       DAM
 M1        ROUTE DISCHARGE THROUGH DAM
 Y                                  1        1
 Y1     1                                                 539.8       -1
 Y4 539.8    540.5    541.0    541.5    542.2    543.0    544.0
 Y5     0      5.8     13.0       22       37       57       82
 $A     0     89.1    116.2    129.7
 $E 530.0    537.0    540.0    560.0
 $$ 539.8
 $D 542.2     2.63      1.5    247.0
 K      1        1                                    1
 M1        CHANNEL ROUTING REACH 1
 Y                                  1        1
 Y1     1
 Y6   0.1    0.035      0.1    527.6    541.6      200    0.011
 Y7     0    541.6      100    531.6      120    529.6    122.5    527.6    127.5    527.6
 Y7   130    529.6      350    530.6      405    541.6
 K      1        2                                    1
 M1        CHANNEL ROUTING REACH 2
 Y                                  1        1
 Y1     1
 Y6   0.1    0.035      0.1      502    520.5     3200    0.008
 Y7     0    520.5      300    516.3      600      512      610      502      625      502
 Y7   635      512      835    514.5     1035      517
 K     99
```

NATIONAL DAM SAFETY PROGRAM
CEDAR LAKE DAM, NEW JERSEY
100 YEAR STORM ROUTING

JOB SPECIFICATION

NO	NHR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
300	0	12	0	0	0	0	0	4	0
			JOPER	NWT	LROPT	TRACE			
			5	0	0	0			

MULTI-PLAN ANALYSES TO BE PERFORMED
NPLAN= 1 NRTIO= 1 LRTIO= 1

RTIOS= 1.00

********** ********** ********** ********** **********

SUB-AREA RUNOFF COMPUTATION

INFLOW HYDROGRAPH TO CEDAR LAKE DAM

ISTAO	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
LAKE	0	0	0	0	0	1	0	0

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
0	2	.46	0.00	.46	0.00	0.000	0	1	0

LOSS DATA

LROPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0	0.00	0.00	1.00	0.00	0.00	1.00	1.50	.15	0.00	0.00

UNIT HYDROGRAPH DATA
TC= 0.00 LAG= .36

RECESSION DATA
STRTQ= -1.00 QRCSN= -.05 RTIOR= 2.00

0
END-OF-PERIOD FLOW

MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q	MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q
									SUM	7.09	4.31	2.78	6903.
										(180.)(	109.)(	71.)(	195.47)

********** ********** ********** ********** **********

HYDROGRAPH ROUTING

ROUTE DISCHARGE THROUGH DAM

ISTAO	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
DAM	1	0	0	0	0	0	0	0

ROUTING DATA

OLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.0	0.000	0.00	1	1	0	0	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	-540.	-1

STAGE	539.80	540.50	541.00	541.50	542.20	543.00	544.00
FLOW	0.00	5.80	13.00	22.00	37.00	57.00	82.00
SURFACE AREA=	0.	89.	116.	130.			
CAPACITY=	0.	208.	515.	2973.			
ELEVATION=	530.	537.	540.	560.			

CREL	SPWID	COOW	EXPW	ELEVL	COOL	CAREA	EXPL
539.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COOD	EXPD	DAMWID
542.2	2.6	1.5	247.

PEAK OUTFLOW IS 9. AT TIME 25.60 HOURS

PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES (SQUARE KILOMETERS)

OPERATION	STATION	AREA	PLAN	RATIO 1
				1.00
HYDROGRAPH AT	LAKE	.46	1	799.
		(1.19)		(22.61)(
ROUTED TO	DAM	.46	1	9.
		(1.19)		(.25)(
ROUTED TO	1	.46	1	9.
		(1.19)		(.25)(
ROUTED TO	2	.46	1	9.
		(1.19)		(.25)(

1 SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	539.80	539.80	542.20
STORAGE	492.	492.	772.
OUTFLOW	0.	0.	37.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
1.00	540.72	0.00	599.	9.	0.00	25.60	0.00

PLAN 1 STATION 1

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
1.00	9.	528.1	25.60

PLAN 1 STATION 2

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
1.00	9.	502.2	25.80

APPENDIX 5

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DATE
IL ME